

FORM PTO-1390 OFFICE (REV. 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK		ATTORNEY'S DOCKET NUMBER 32860-000186/US	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 10/049820	
INTERNATIONAL APPLICATION NO. PCT/DE00/02779		INTERNATIONAL FILING DATE August 11, 2000		PRIORITY DATE CLAIMED August 18, 1999	
TITLE OF INVENTION CONNECTING BARS FOR ELECTRICAL APPLIANCES AND DEVICES FOR DIFFERENT NOMINAL CURRENTS					
APPLICANT(S) FOR DO/EO/US Michael BACH; Detlev SCHMIDT; Michael SEBEKOW; Guenter SEIDLER-STAHLE; Ingo THIEDE; Sezai TUERKMEN					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1). 4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31). 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). WO 01/13391 A1 b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). a. <input checked="" type="checkbox"/> is transmitted herewith. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4) 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)). a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).					
Items 11. to 20. below concern document(s) or information included:					
11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98-1449 and International Search Report (PCT/ISA/210) in German with seven (7) references and a German Translation Aid. 12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. 14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 15. <input checked="" type="checkbox"/> A substitute specification. 16. <input type="checkbox"/> A change of power of attorney and/or address letter. 17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825. 18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). 19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). 20. <input checked="" type="checkbox"/> Other items or information: 1) TWO (2) sheets of Formal Drawings 2.) Article 34 Amended Specification and Claims					

U.S. APPLICATION NO (if known, see 37 CFR 1.5) 10/049820		INTERNATIONAL APPLICATION NO PCT/DE00/02779		ATTORNEY'S DOCKET NUMBER 32860-000186/US	
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<p>21. <input checked="" type="checkbox"/> The following fees are submitted:</p> <p>BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$1,040.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO. \$890.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO. \$710.00</p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00</p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4). \$100.00</p> <p>ENTER APPROPRIATE BASIC FEE AMOUNT =</p> <p>Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:15%;">CLAIMS</th> <th style="width:20%;">NUMBER FILED</th> <th style="width:20%;">NUMBER EXTRA</th> <th style="width:15%;">RATE</th> <th style="width:15%;"></th> <th style="width:15%;"></th> </tr> <tr> <td>Total Claims</td> <td>19 - 20 =</td> <td>0</td> <td>X \$18.00</td> <td>\$</td> <td>0</td> </tr> <tr> <td>Independent Claims</td> <td>1 - 3 =</td> <td>0</td> <td>X \$80.00</td> <td>\$</td> <td>0</td> </tr> <tr> <td colspan="4">MULTIPLE DEPENDENT CLAIM(S) (if applicable) None</td> <td>+</td> <td>\$270.00</td> </tr> <tr> <td colspan="4">TOTAL OF ABOVE CALCULATIONS =</td> <td>\$</td> <td>890.00</td> </tr> </table> <p><input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are <input type="checkbox"/> reduced by 1/2.</p> <p style="text-align: right;">SUBTOTAL = \$ 890.00</p> <p>Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).</p> <p style="text-align: right;">TOTAL NATIONAL FEE = \$ 890.00</p> <p>Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +</p> <p style="text-align: right;">TOTAL FEES ENCLOSED = \$ 930.00</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:60%;"></td> <td style="width:10%; text-align: center;">Amount to be:</td> <td style="width:10%;"></td> <td style="width:20%;"></td> </tr> <tr> <td></td> <td style="text-align: center;">refunded</td> <td style="text-align: center;">\$</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">charged</td> <td style="text-align: center;">\$</td> <td></td> </tr> </table>	CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE			Total Claims	19 - 20 =	0	X \$18.00	\$	0	Independent Claims	1 - 3 =	0	X \$80.00	\$	0	MULTIPLE DEPENDENT CLAIM(S) (if applicable) None				+	\$270.00	TOTAL OF ABOVE CALCULATIONS =				\$	890.00		Amount to be:				refunded	\$			charged	\$		<p>CALCULATIONS PTO USE ONLY</p>
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a. ☐ A check in the amount of \$ _____ to cover the above fees is enclosed.

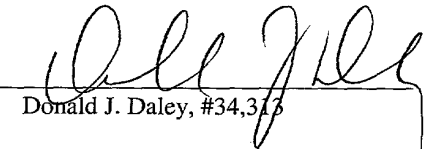
b. ☒ Please charge my Deposit Account. No. 08-0750 in the amount of \$930.00 to cover the above fees.
 A triplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
 overpayment to Deposit Account No. 08-0750.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR
 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:
Harness, Dickey & Pierce, P.L.C. - Customer No. 30596
Post Office Box 8910
Reston, Virginia 20195

Date: FEBRUARY 19, 2002

By 
 Donald J. Daley, #34,313

BOX PCT
PATENT
32860-000186

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicants: Michael BACH; Detlev SCHMIDT; Michael SEBEKOW; Guenter
SEIDLER-STAHLE; Ingo THIEDE; and Sezai TUERKMEN

Int'l Application No. PCT/DE00/02779

Application No.: NEW

Filed: February 19, 2002

For: CONNECTING BARS FOR ELECTRICAL APPLIANCES AND
DEVICES FOR DIFFERENT NOMINAL CURRENTS.

PRELIMINARY AMENDMENT

BOX PCT

Assistant Commissioner for Patents
Washington, DC 20231

February 19, 2002

Sir:

The following preliminary amendments and remarks are respectfully submitted in
connection with the above-identified application.

IN THE ABSTRACT OF THE DISCLOSURE

Please replace the original Abstract with the attached revised Abstract.

IN THE SPECIFICATION

Please replace the Specification with the attached Substitute Specification attached
hereto.

IN THE CLAIMS

Please amend the claims as follows:

1. (Amended) A connecting bar for connection of electrical components of
electrical appliances and devices to an external circuit comprising:

an outer cross section for nominal currents of different levels, for accommodation in at least one of a wall of the appliances or devices, and a window opening adapted to said outer cross section, the outer cross section being fastenable to a wall by a fastener, wherein the connecting bar is hollow, with a similar outer cross section to other connecting bars, with a remaining wall thickness being adapted to a respective nominal current.

2. (Amended) The connecting bar as claimed in claim 1, wherein the connecting bar includes only one cavity.

3. (Amended) The connecting bar as claimed in claim 1, wherein the connecting bar includes a plurality of cavities.

4. (Amended) The connecting bar as claimed in claim 1, wherein the connecting bar includes at least one bore for fastening purposes.

5. (Amended) The connecting bar as claimed in claim 4, wherein the at least one bore includes a thread.

6. (Amended) The connecting bar as claimed in claim 4, wherein the connecting bar includes at least two bores and wherein a bore in a connecting bar on an upper side and a bore on an underside are arranged in a common axis.

7. (Amended) The connecting bar as claimed in claim 4, wherein the connecting bar includes at least two bores, and wherein a bore in a connecting bar on an upper side and a bore on an underside are arranged offset with respect to one another.

8. (Amended) The connecting bar as claimed in claim 1, wherein the connecting bar includes a plurality of cavities, between which, at least one suitable web is included for increasing strength.

9. (Amended) The connecting bar as claimed in claim 4, wherein the at least one bore in the connecting bar is arranged in the region of a cavity.

10. (Amended) The connecting bar as claimed in claim 4, wherein the at least one bore in the connecting bar is arranged in a web.

11. (Amended) The connecting bar as claimed in claim 1, including at least one stop for axial fixing.

12. (Amended) The connecting bar as claimed in claim 1, wherein the cavity is arranged transversely with respect to a longitudinal extent of the connecting bar and is open on both sides.

Please add the following new claims:

-- 13. The connecting bar of claim 1, wherein the connecting bar is configured so as to be connectable to other similarly configured connecting bars.

14. The connecting bar as claimed in claim 1, including a plurality of bores for fastening purposes.

15. The connecting bar as claimed in claim 14, wherein each of the plurality of bores includes a thread.

16. The connecting bar of claim 3, including a plurality of webs, each between cavities, for increasing strength.

17. The connecting bar as claimed in claim 8, wherein the at least one bore in the connecting bar is arranged in the region of a cavity.

18. The connecting bar as claimed in claim 8, wherein the at least one bore in the connecting bar is arranged in a web.

19. The connecting bar as claimed in claim 1, including a plurality of stops for axial fixing. --

REMARKS

Claims 1-19 are now present in this application, with new claims 13-19 being added by the present Preliminary Amendment. It should be noted that the amendments to original claims 1-12 of the present application are non-narrowing amendments, made solely to place the claims in proper form for U.S. practice and not to overcome any prior art or for any other statutory considerations. For example, amendments have been made to broaden the claims; remove reference numerals in the claims; remove the European phrase "characterized in that"; remove multiple dependencies in the claims; and to place claims in a more recognizable U.S. form, including the use of the transitional phrase "comprising" as well as the phrase "wherein". Other such non-narrowing amendments include changing the phrase "or" to --at least one of--, and reorganizing apparatus-type claims (setting forth elements in separate paragraphs) in a more recognizable U.S. form. Again, all amendments are non-narrowing and have been made solely to place the claims in proper form for U.S. practice and not to overcome any prior art or for any other statutory considerations.

SUBSTITUTE SPECIFICATION

In accordance with 37 C.F.R. §1.125, a substitute specification has been included in lieu of substitute paragraphs in connection with the present Preliminary Amendment. The substitute specification is submitted in clean form, attached hereto, and is accompanied by a marked-up version showing the changes made to the original specification. The changes have

been made in an effort to place the specification in better form for U.S. practice. No new matter has been added by these changes to the specification. Further, the substitute specification includes paragraph numbers to facilitate amendment practice as requested by the U.S. Patent and Trademark Office.

CONCLUSION

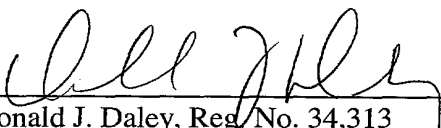
Accordingly, in view of the above amendments and remarks, an early indication of the allowability of each of claims 1-19 in connection with the present application is earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Donald J. Daley at the telephone number of the undersigned below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKY & PIERCE, P.L.C

By: 
Donald J. Daley, Reg. No. 34,313

DJD:kna

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Reston, Virginia 20195
(703) 390-3030

ABSTRACT OF THE DISCLOSURE

Connecting bars for electrical appliances and devices, for different nominal currents, are configured in such a way that they are hollow. They may have only one or more than one cavity. The connecting bars have the same outer cross section for all current intensities, have different wall thicknesses, and consequently have differently sized cavities, for different current intensities. Consequently, the lead-through openings for the connecting bars in the respective switch housings of a type series can all be configured identically, corresponding to the dimensions for the connecting bars of the maximum current intensity.

SUBSTITUTE SPECIFICATION

CONNECTING BARS FOR ELECTRICAL APPLIANCES AND DEVICES FOR DIFFERENT NOMINAL CURRENTS

[0001] This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/DE00/02779 which has an International filing date of August 11, 2000, which designated the United States of America, the entire contents of which are hereby incorporated by reference.

Field of the Invention

[0002] The invention geneally relates to connecting bars. Preferably, it relates to connecting bars made of profiled semifinished material for electrical appliances and devices for the connection of electrical components of the electrical appliances and devices to an external circuit. More preferably, the connecting bars include the same outer cross section for nominal currents of different levels and are accommodated in a wall of the appliances or devices, in a window opening adapted to the cross section, and preferably fixed on the wall by a fastener.

Background of the Invention

[0003] On the part of a connecting bar led throughout of the housing to the outside, such as that described in FR 2 484 135 A1, an equipment-side power feeding bar can be connected in this way. The connecting bar is in this case generally arranged securely in the insulating wall of an appliance or device, which can take place for example by clamping bolts.

[0004] According to the above-mentioned FR 2 484 135 A1, the connecting bars are adapted to the different nominal currents by putting together the standard cross section of a plurality of pieces, which consist of copper or aluminum. For the highest intended nominal current, only pieces made of copper are used, while for the lowest intended nominal current only pieces of aluminum are used. For nominal currents lying in between, the connecting bars have combinations of pieces made of the two materials, for example one piece made of copper, three pieces made of aluminum.

[0005] There is also the proposal (earlier patent application with the application number DE 199 30 813.6, published as DE 199 30 813 A1) of producing connecting bars from sections of a profiled semifinished material which include webs or ribs, which add to a cross section dependent on the nominal current to give a spacing dimension that is the same for all nominal currents. This makes it unnecessary to use different materials and a plurality of pieces.

[0006] Connecting bars of the type stated above may at the same time have a feature disclosed by DE 196 43 607 A1, that is a further projection (web, rib), which serves as an axial positioning and supporting device for the connecting bar on the wall of the housing of the appliance or device. Further fasteners are then either not required at all or only required in a simplified form. If bolts are used as such fasteners, they can engage in a nut thread, which is formed in a known way by a metallic insert nut or press-in nut located in the insulating material of the wall (DE 35 39 673 A1).

[0007] It follows from the descriptions given above that the current-carrying capacity, heat dissipation, provision of a surface for connections of power feeding bars and the absorption and transmission of static and dynamic forces are among the main tasks of the connecting bars. In addition, it is intended for it to be possible to accommodate connecting bars for different current intensities in walls with standard lead-through openings.

SUMMARY OF THE INVENTION

[0008] An object of the present invention is therefore to provide connecting bars which have the properties mentioned and can be produced inexpensively.

[0009] This object is achieved according to the invention, for example, by the connecting bars being configured in such a way that they are hollow, with the same outer cross section, and with the remaining wall thickness being adapted to the respective nominal current.

[00010] A current-carrying hollow arrangement is already described in US 3,597,713, which shows an apparatus as a substitute for a high-voltage fusible link, in which a combination of a vacuum switch with an operating handle, which includes a lug in a way similar to a high-voltage or medium-voltage circuit breaker, is represented. Installed in a hollow connecting piece of the apparatus is an electronic circuit. Although this discloses a current-carrying hollow part on an electrical switching device, it serves only for accommodating another component of the apparatus, that is the electronic circuit, and not for regulating the current-carrying capacity of the subassembly.

[00011] A switching apparatus described in US 3 953 695 likewise has a hollow connector. A coolant is passed through the cavity, since it is a heavy-current switching device and the dimensions of the connector are to be restricted. By contrast with the invention, it is therefore not based on an outer cross section which corresponds to the highest current value, with the cavity depending on the nominal current respectively intended.

[00012] In contrast to this, in the case of the connecting bars according to the invention the current-carrying capacity is regulated by use of the wall thickness of the hollow bar which forms the conducting, current-carrying cross section. It follows from this that, in the case of lower current intensities, there is a larger internal cavity as a result of lower wall thicknesses, or in the case of higher current intensities there is a smaller internal cavity as a result of

thicker wall thicknesses, which can be taken to the extent of a solid configuration without a cavity, in the case of the highest rated current intensity. The lead-through openings in the respective housings of the appliances or devices are then designed for the outer dimensions required for this highest rated current intensity.

[00013] It may be expedient to provide the connecting bars with only one cavity. Various aspects, in particular the size of the overall outer cross section, may however favor the provision of a plurality of cavities.

[00014] In the case of connecting bars, bores may be required, formed with or without a thread, for example for purposes of fastening on the housing or against axial displacement. These bores may be arranged in a common axis or else offset with respect to one another. To avoid deformation of the hollow connecting bars being caused by the clamping force of the bolts led through these bores or screwed into the thread of these bores, suitable webs may be provided between the cavities of the connecting bars for increasing the strength. With respect to the production of the profiled material, this possibly includes extra expenditure, but has no influence on the current-carrying capacity.

[00015] To avoid this possible extra expenditure, guiding grooves running transversely with respect to the longitudinal direction of the connecting bar may also be provided in the cavity of the connecting bar for supporting webs which are to be pushed in as and when required. The supporting webs to be pushed into these guiding grooves may include the same material as the connecting bar, but may also include a different material.

[00016] These pushed-in supporting webs serve the same purpose as the molded-on supporting webs, that is to stabilize the connecting bar against deformation of the hollow connecting bar caused by the clamping force or loading exerted by screw bolts led through the bores or bolts screwed into the thread of these bores.

[00017] Since these pushed-in supporting webs have no influence on the current-carrying capacity, other aspects, such as for example strength, can be taken into consideration as assessment parameters for the selection of the material.

[00018] The bores mentioned above, formed with or without a thread, may be arranged in the region of cavities, which is expedient in particular whenever the bolts are led through, these bolts then having to have a common axis and not requiring any thread.

[00019] If the bores are formed with a thread, it may be advantageous to arrange them in such a way that they are located in a web. This makes larger thread lengths possible, which allows the screwed connection to be subjected to higher loading.

[00020] To avoid fastening bores, the connecting bars may also be provided with stops known per se for axial fixing. They are then fixed in the axial direction by suitable fastening elements known per se, for example clamping bolts. At the same time or in addition, stops of this type can absorb axial forces and transmit them to the housing.

[00021] In the case of all the connecting bars described above, the cavity or cavities can be arranged transversely with respect to the longitudinal extent of the connecting bar and be open on both sides. In this configuration, an extruded part can be advantageously produced as the starting material, from which individual connecting bars of a respectively required width can be cut off.

BRIEF DESCRIPTION OF THE DRAWINGS

[00022] The invention is to be explained in more detail below for better understanding on the basis of preferred examples, which do not restrict the extent of protection of the invention, with reference to the associated drawing.

Figure 1 schematically shows a first embodiment of a connecting bar, for a low current intensity.

Figure 2 schematically shows a second embodiment of a connecting bar, for a higher current intensity.

Figure 3 schematically shows a third embodiment of a connecting bar, with one cavity and fastening bores.

Figure 4 schematically shows a fourth embodiment of a connecting bar, with a plurality of cavities.

Figure 5 schematically shows a fifth embodiment of a connecting bar, with a plurality of cavities.

Figure 6 schematically shows a sixth embodiment of a connecting bar, with one cavity and supporting webs which can be pushed in arranged therein.

Figure 7 schematically shows a seventh embodiment of a connecting bar, with stops for axial fixing.

[00023] In figure 8, a connecting bar is shown in plan view, with an indicated device wall.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[00024] Figure 1 shows a first embodiment of a connecting bar 1 for electrical appliances and devices for a low current intensity. In this embodiment, it preferably includes only a single cavity 2, which extends essentially over its entire dimension. This connecting bar 1 has a thinner wall 3, adapted to the low operating current. Since the outer dimensions, that is the outer cross section of the connecting bar 1, is intended to represent a constant, the cavity 2 is relatively large because of the small wall thickness.

[00025] Figure 2 shows a second embodiment of a connecting bar 4 for electrical appliances and devices for a higher current intensity. In this embodiment, it likewise preferably includes only a single cavity 5, which extends essentially over its entire dimension. This connecting

bar 4 has a thicker wall 6, adapted to the higher operating current. Since the outer dimensions, that is the outer cross section of the connecting bar 4, is likewise intended to represent a constant, the cavity 5 is relatively small because of the thicker wall thickness.

[00026] Figure 3 shows a third embodiment of a connecting bar 7 for electrical appliances and devices with preferably one cavity 8, which extends essentially over its entire dimension. This connecting bar 7 includes bores 9; 10; 11; 12, which are provided for fastening purposes and, if appropriate, have a thread. In the example, the bores 9 and 10 are arranged in a common axis, which is required when through-bolts are used, and the bores 11 and 12 are arranged offset, which may be expedient for example when individual bolts are used. These bores are then provided with a thread.

[00027] Figure 4 shows a fourth embodiment of a connecting bar 13 for electrical appliances and devices with a plurality of cavities 18; 19; 20, between which webs 21; 22 are provided. In this connecting bar 13, bores 14; 15; 16; 17 are provided in the region of the cavities 18, 19 and 20. The webs 21 and 22 serve for increasing the strength and for the purpose of avoiding deformation of the hollow connecting bar 13 caused by the clamping force or loading of the screw bolts led through these bores 14 to 17 or bolts screwed into the thread of these bores 14 to 17.

[00028] Figure 5 shows a fifth embodiment of a connecting bar 23 for electrical appliances and devices, with a plurality of cavities 24; 25; 26. In the case of this embodiment, the bores 27; 28, provided with a thread which is not represented, are arranged in such a way that they are located in a web 29; 30. As a result, greater thread lengths are possible, which makes it possible for the screwed connections to be subjected to higher loading.

[00029] Figure 6 shows a sixth embodiment of a connecting bar 31 for electrical appliances and devices, with a cavity 32 extending essentially over the entire extent of the connecting bar 31. In the case of this embodiment, the profiled semifinished material has guiding grooves 35; 36; 37; 38, which are arranged transversely with respect to the longitudinal axis and into which supporting webs 33; 34 can be pushed as and when required. The supporting webs 33; 34 which can be pushed into these guiding grooves 35; 36; 37; 38 may include the same material as the connecting bar 31, but may also include a different material.

[00030] These pushed-in supporting webs 33; 34 serve the same purpose as the molded-on supporting webs, that is to stabilize the connecting bar 31 against deformation of the hollow connecting bar 31 caused by the clamping force or loading of screw bolts led through the bores 39; 40; 41; 42 or bolts screwed into the thread of these bores. However, it is possible for no bores to be arranged in them.

[00031] Figure 7 shows a seventh embodiment of a connecting bar 43 for electrical appliances and devices with stops 44; 45 for axial fixing of the connecting bar 43 in the corresponding housing. By use of these stops 44; 45, the connecting bar 43 is fixed in the

axial direction by suitable fastening elements, for example clamping bolts. At the same time or in addition, these stops 44; 45 can absorb axial forces and transmit them to the housing.

[00032] Figure 8 schematically illustrates one of the connecting bars described above, for example the connecting bar 1 (figure 1), in plan view. As can be seen, the cavity 2 extends transversely with respect to the longitudinal direction and is open on both sides. Also indicated is a wall of a device housing 46, through which the connecting bar 1 extends.

[00033] The advantages of the solution according to the invention are that standard outer dimensions of the connecting bars can be achieved within one overall size, dispensing with the need for spacers and the like. Standard insertion openings, and consequently standard housing dimensions, can be used within one overall size, which has the consequence of greatly reducing the range of different variants and of reducing costs. The bores of the hollow profiles may be punched, which is less costly and neater than drilling. The connecting technique is simplified to one variant for each overall size, thereby simplifying production. The greatly enlarged surface of hollow profiles which are open at the sides has the effect of better heat dissipation.

[00034] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

20049820.021902

01-18-2001 GR 1999 P 04141 WO

PCT/DE00/02779

MARKED-UP SPECIFICATION

EPO-BERLIN

01-18-2001

Description

Connecting bars for electrical appliances and devices
for different nominal currents

5

FIELD OF THE INVENTION

Generally

Preferably, it relates to connecting bars

10

The invention relates to connecting bars, made of profiled semifinished material for electrical appliances and devices for the connection of electrical components of the electrical appliances and devices to an external circuit. ^{More preferably, the connecting bars include} the ~~lacuna~~ having the same outer cross section for nominal currents of different levels and ^{are} being accommodated in a wall of the appliances or devices, ^{or} in a window opening adapted to ^{the} said cross section, and ^{preferably} fixed on the wall by ^{a fastener} fastening means.

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BACKGROUND OF THE INVENTION

On the part of a connecting bar led ^{throughout} through out of the housing to the outside, such as that described in FR 2 484 135 A1, an equipment-side power feeding bar can be connected in this way. The connecting bar is in this case generally arranged securely in the insulating wall of an appliance or device, which can take place for example by clamping bolts.

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above -

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According to the mentioned FR 2 484 135 A1, the connecting bars are adapted to the different nominal currents by putting together the standard cross section of a plurality of pieces, which consist of copper or aluminum. For the highest intended nominal current, only pieces made of copper are used, while for the lowest intended nominal current only pieces of aluminum are used. For nominal currents lying inbetween, the connecting bars have combinations of pieces made of the two ~~said~~ materials, for example one piece made of copper, three pieces made of aluminum.

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There is also the proposal (earlier patent application with the application number DE 199 30 813.6, published as DE 199 30 813 A1) of producing connecting bars from sections of a profiled semifinished material which ^{include} ~~has~~ webs or ribs, which add to a cross section dependent on the nominal current to give a spacing dimension that is the same for all nominal currents. This makes it unnecessary to use different materials and a plurality of pieces.

10

Connecting bars of the type stated above may at the same time have a feature disclosed by DE 196 43 607 A1, that is a further projection (web, rib), which serves as an axial positioning and supporting ^{device} ~~means~~ for the connecting bar on the wall of the housing of the appliance or device. Further ^{fasteners} ~~fastening means~~ are then either not required at all or ^{as such fasteners} ~~only~~ required in a simplified form. If bolts are used, they can engage in a nut thread, which is formed in a known way by a metallic insert nut or press-in nut located in the insulating material of the wall (DE 35 39 673 A1).

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It follows from the descriptions given above that the current-carrying capacity, heat dissipation, provision of a surface for connections of power feeding bars and the absorption and transmission of static and dynamic forces are among the main tasks of the connecting bars. In addition, it is intended for it to be possible to accommodate connecting bars for different current intensities in walls with standard lead-through openings.

25

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SUMMARY OF THE INVENTION

~~At~~ The object of the present invention is therefore to

provide connecting bars which have the properties mentioned and can be produced inexpensively.

- This object is achieved according to the invention, ^{for example,} by the connecting bars being configured in such a way that they are hollow, with the same outer cross section, and ^{with} the remaining wall thickness being adapted to the respective nominal current.
- 10 A current-carrying hollow arrangement is already described in US 3,597,713, which shows an apparatus as a substitute for a high-voltage fusible link, in which a combination of a vacuum switch with an operating handle, which ^{includes} has a lug in a way similar to a high-voltage or medium-voltage circuit breaker, is represented. Installed in a hollow connecting piece of the apparatus is an electronic circuit. Although this discloses a current-carrying hollow part on an electrical switching device, it serves only for accommodating another component of the apparatus, that is ^{the} said electronic circuit, and not for regulating the current-carrying capacity of the subassembly.
- 15 A switching apparatus described in US 3 953 695 likewise has ^a hollow ^{connector} ~~connecting means~~. A coolant is passed through the cavity, since it is a heavy-current switching device and the dimensions of the ^{connector} ~~connecting means~~ are to be restricted. By contrast with the invention, it is therefore not based on an outer cross section which corresponds to the highest current value, with the cavity depending on the nominal current respectively intended.
- 20 In contrast to this, in the case of the connecting bars according to the invention the current-carrying capacity is regulated by ^{use} ~~means~~ of the wall thickness of

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the hollow bar which forms the conducting, current-carrying

cross section. It follows from this that, in the case of lower current intensities, there is a larger internal cavity as a result of lower wall thicknesses, or in the case of higher current intensities there is a smaller internal cavity as a result of thicker wall thicknesses, which can be taken to the extent of a solid configuration without a cavity, in the case of the highest rated current intensity. The lead-through openings in the respective housings of the appliances or devices are then designed for the outer dimensions required for this highest rated current intensity.

It may be expedient to provide the connecting bars with only one cavity. Various aspects, in particular the size of the overall outer cross section, may however favor the provision of a plurality of cavities.

In the case of connecting bars, bores may be required, formed with or without a thread, for example for purposes of fastening on the housing or against axial displacement. These bores may be arranged in a common axis or else offset with respect to one another. To avoid deformation of the hollow connecting bars being caused by the clamping force of the bolts led through these bores or screwed into the thread of these bores, suitable webs may be provided between the cavities of the connecting bars for increasing the strength. With respect to the production of the profiled material, this possibly ~~means~~ ^{includes} extra expenditure, but has no influence on the current-carrying capacity.

To avoid this possible extra expenditure, guiding grooves running transversely with respect to the longitudinal direction of the connecting bar may also be provided in the cavity of the connecting bar for supporting webs which are to be pushed in as and when required. The

supporting webs to be pushed into these guiding grooves
may ~~consist of~~^{include} the same material as the connecting bar,
but may also ~~consist of~~^{include} a different material.

- 5 These pushed-in supporting webs serve the same purpose
as the molded-on supporting webs, that is to stabilize
the connecting bar against deformation of the hollow
connecting bar caused by the clamping force or loading
exerted by screw bolts led through the bores or bolts
10 screwed into the thread of these bores.

Since these pushed-in supporting webs have no influence
on the current-carrying capacity, other aspects, such
as for example strength, can be taken into
15 consideration as assessment parameters for the
selection of the material.

The bores mentioned above, formed with or without a
thread, may be arranged in the region of cavities,
20 which is expedient in particular whenever the bolts are
led through, these bolts then having to have a common
axis and not requiring any thread.

If the bores are formed with a thread, it may be
25 advantageous to arrange them in such a way that they
are located in a web. This makes larger thread lengths
possible, which allows the screwed connection to be
subjected to higher loading.

30 To avoid fastening bores, the connecting bars may also
be provided with stops known per se for axial fixing.
They are then fixed in the axial direction by suitable
fastening elements known per se, for example clamping
bolts. At the same time

or in addition, stops of this type can absorb axial forces and transmit them to the housing.

In the case of all the connecting bars described above,
5 the cavity or cavities can be arranged transversely with respect to the longitudinal extent of the connecting bar and be open on both sides. In this configuration, an extruded part can be advantageously produced as the starting material, from which
10 individual connecting bars of a respectively required width can be cut off.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is to be explained in more detail below for better understanding on the basis of preferred
15 examples, which do not restrict the extent of protection of the invention, with reference to the associated drawing.

Figure 1 schematically shows a first embodiment of a
20 connecting bar, for a low current intensity.

Figure 2 schematically shows a second embodiment of a connecting bar, for a higher current intensity.

25 Figure 3 schematically shows a third embodiment of a connecting bar, with one cavity and fastening bores.

Figure 4 schematically shows a fourth embodiment of a
30 connecting bar, with a plurality of cavities.

Figure 5 schematically shows a fifth embodiment of a connecting bar, with a plurality of cavities.

Figure 6 schematically shows a sixth embodiment of a connecting bar, with one cavity and supporting webs which can be pushed in arranged therein.

- 5 Figure 7 schematically shows a seventh embodiment of a connecting bar, with stops for axial fixing.

In figure 8, a connecting bar is shown in plan view, with an indicated device wall.

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

- Figure 1 shows a first embodiment of a connecting bar 1 for electrical appliances and devices for a low current intensity. In this embodiment, it ^{preferably includes} ~~has~~ only a single cavity 2, which extends essentially over its entire dimension. This connecting bar 1 has a thinner wall 3, adapted to the low operating current. Since the outer dimensions, that is the outer cross section of the connecting bar 1, is intended to represent a constant, the cavity 2 is relatively large because of the small wall thickness.
- 15
- 20

- Figure 2 shows a second embodiment of a connecting bar 4 for electrical appliances and devices for a higher current intensity. In this embodiment, it ^{preferably includes} ~~likewise has~~ only a single cavity 5, which extends essentially over its entire dimension. This connecting bar 4 has a thicker wall 6, adapted to the higher operating current. Since the outer dimensions, that is the outer cross section of the connecting bar 4, is likewise intended to represent a constant, the cavity 5 is relatively small because of the thicker wall thickness.
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- 30

Figure 3 shows a third embodiment of a connecting bar 7 for electrical appliances and devices with ^{preferably} one cavity 8, which extends essentially over its entire dimension. This connecting bar 7 ^{includes} has bores 9; 10; 11; 12, which are provided for fastening purposes and, if appropriate, have a thread. In the example, the bores 9 and 10 are arranged in a common axis, which is required when through-bolts are used, and the bores 11 and 12 are arranged offset, which may be expedient for example when individual bolts are used. These bores are then provided with a thread.

Figure 4 shows a fourth embodiment of a connecting bar 13 for electrical appliances and devices with a plurality of cavities 18; 19; 20, between which webs 21; 22 are provided. In this connecting bar 13, bores 14; 15; 16; 17 are provided in the region of the cavities 18, 19 and 20. ^{The} ~~Said~~ webs 21 and 22 serve for increasing the strength and for the purpose of avoiding deformation of the hollow connecting bar 13 caused by the clamping force or loading of the screw bolts led through these bores 14 to 17 or bolts screwed into the thread of these bores 14 to 17.

Figure 5 shows a fifth embodiment of a connecting bar 23 for electrical appliances and devices, with a plurality of cavities 24; 25; 26. In the case of this embodiment, the bores 27; 28, provided with a thread which is not represented, are arranged in such a way that they are located in a web 29; 30. As a result, greater thread lengths are possible, which makes it possible for the screwed connections to be subjected to higher loading.

Figure 6 shows a sixth embodiment of a connecting bar 31 for electrical appliances and devices, with a cavity 32 extending essentially over the entire extent of the connecting bar 31. In the case of this embodiment, the
5 profiled semifinished material has guiding grooves 35; 36; 37; 38, which are arranged transversely with respect to the longitudinal axis and into which supporting webs 33; 34 can be pushed as and when required. The supporting webs 33; 34 which can be
10 pushed into these guiding grooves 35; 36; 37; 38 may ~~consist of~~^{include} the same material as the connecting bar 31, but may also ~~consist of~~^{include} a different material.

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15 These pushed-in supporting webs 33; 34 serve the same purpose as the molded-on supporting webs, that is to stabilize the connecting bar 31 against deformation of the hollow connecting bar 31 caused by the clamping force or loading of screw bolts led through the bores 39; 40; 41; 42 or bolts screwed into the thread of
20 these bores. However, it is possible for no bores to be arranged in them.

Figure 7 shows a seventh embodiment of a connecting bar 43 for electrical appliances and devices with stops 44; 45 for axial fixing of the connecting bar 43 in the
25 corresponding housing. By ~~means~~^{use} of these stops 44; 45, the connecting bar 43 is fixed in the axial direction by suitable fastening elements, for example clamping bolts. At the same time or in addition, these stops
30 44; 45 can absorb axial forces and transmit them to the housing.

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Figure 8 schematically illustrates one of the connecting bars described above, for example the connecting bar 1 (figure 1), in plan view. As can be seen, the cavity 2 extends transversely with respect to the longitudinal direction and is open on both sides. Also indicated is a wall of a device housing 46, through which the connecting bar 1 extends.

The advantages of the solution according to the invention are that standard outer dimensions of the connecting bars can be achieved within one overall size, dispensing with the need for spacers and the like. Standard insertion openings, and consequently standard housing dimensions, can be used within one overall size, which has the consequence of greatly reducing the range of different variants and of reducing costs. The bores of the hollow profiles may be punched, which is less costly and neater than drilling. The connecting technique is simplified to one variant for each overall size, thereby simplifying production. The greatly enlarged surface of hollow profiles which are open at the sides has the effect of better heat dissipation.

VARIA TIONS
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What is claimed is:

Patent claims

A connecting bar,

1. ^(Amended) [Connecting bars (1; 4; 7; 13; 23; 31; 43)] made of profiled semifinished material for electrical appliances and devices] for [the] connection of electrical components of [the] electrical appliances and devices to an external circuit, [the connecting bars (1; 4; 7; 13; 23; 31; 43) having the same ^{comprising} outer cross section for nominal currents of different levels, and being accommodated ^{for accommodation in at least one of} in a wall (46) of the appliances or devices, ^{and} in a window opening adapted to said ^{outer} cross section, [and fixed] ^{on} ^{the} wall by ^{a fastener} fastening means, characterized in that ^{wherein} the connecting bars (1; 4; 7; 13; 23; 31; 43) are configured in such a way that they are ^{hollow}, with [the same] ^{a similar} outer cross section, ^{to other connecting bars} and they ^{with a} remaining wall thickness ^{being} is adapted to [the] respective nominal current.
2. ^(Amended) The connecting bar as claimed in claim 1, [characterized in that the ^{wherein a plurality of the} connecting bars (1; 4; 7; 31;) have ^{bar includes} only one cavity (2; 5; 8; 32)].
3. ^(Amended) The connecting bar as claimed in claim 1, [characterized in that ^{wherein} the connecting ^{bar} bars (13; 23) have ^{includes} a plurality of cavities (18-20; 24-26)].
4. ^(Amended) The connecting bar as claimed in [one of the preceding claims], ^{claim} characterized in that ^{wherein} the connecting bars (7; 13; 23; 31) have ^{bar includes at least one bore} bores (9-12; 14-17; 27; 28; 39-42) for fastening purposes.
5. ^(Amended) The connecting bar as claimed in claim 4,

(characterized in that) ^{- 12 wherein} the bores (9-12; 14-17; 27; 28; 39-42) have a thread. ^{at least one bore includes}

6. ^(Amended) The connecting bar as claimed in claim 4, ^{connecting bar includes at least two} characterized in that ^{wherein} the bores (9; 10; 14-17; 39-42) ^{and wherein ~~the~~ bore} in a connecting bar (7; 13; 31;) on ^{an} the upper side and ^{a bore on an} the underside of the same are arranged in a common axis.

7. ^(Amended) The connecting bar as claimed in claim 4, ^{connecting bar includes at least two} characterized in that ^{wherein} the bores (11-12) in a connecting bar (7) on ^{an} the upper side and ^{a bore on an} the underside of the same are arranged offset with respect to one another.

8. ^(Amended) The connecting bar as claimed in claim 1, ^{bar includes a plurality of} characterized in that ^{wherein} the connecting bars (13; 23) ^{between which} have between the cavities (18-20; 24-26) of the same ^{at least one web} suitable webs (21; 22; 29; 30) ^{is included} for increasing the strength.

9. ^(Amended) The connecting bar as claimed in ^{claim} claims 4 and 8, ^{wherein} characterized in that the bores (9-12; 14-17; 39-42) ^{at least one bore} in the connecting bars (7; 13; 31) are arranged in the region of cavities (8; 18-20; 32) ^{a cavity}.

10. ^(Amended) The connecting bar as claimed in ^{claim} claims 4 and 8, ^{wherein} characterized in that the bores (27; 28) in the connecting ^{bar} bars (23) are arranged in the webs (29; 30) ^{a web}.

(Amended)
 11. The connecting bar as claimed in claim 1, [characterized in that the connecting bars (43) are provided with stops (44; 45) known per se for axial fixing.] ^{least one} ~~including a stop~~

5 (Amended)
 12. The connecting bar as claimed in ^{Claim 1} ~~one~~ of the preceding claims, [characterized in that] ^{wherein} the cavity [or cavities (18-20; 24-26)] is [or are] arranged transversely with respect to (the) longitudinal extent of the connecting bar [(1, 4, 7, 31; 13, 23)] and is [or are] open on both sides.

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13. The connecting bar of claim 1, wherein the connecting bar is configured so as to be ^{connectable} ~~attachable~~ to other similarly configured connecting bars.
14. The connecting bar as claimed in claim 1, including a plurality of bores for fastening purposes.
15. The connecting bar as claimed in claim 14, wherein each of the plurality of bores includes a thread.
16. The connecting bar of claim 3, including a plurality of webs, each between cavities, for increasing strength.
17. same as 9, but dep on 8
18. same as 10, but dep on 8
19. same as 11, but change "at least one stop" to -- a plurality of stops --

~~200~~

Connecting bars for electrical appliances and devices for different nominal currents

The invention relates to connecting bars (1; 4; 7; 13; 31; 43) for electrical appliances and devices, for different nominal currents, which bars are configured in such a way that they are hollow. They may have only one or more than one cavity (2; 5; 8; 18-20; 24-26; 32). The connecting bars (1; 4; 7; 13; 31; 43) have the same outer cross section for all current intensities, ^{have} they have different wall thicknesses, and consequently differently sized cavities (2; 5; 8; 18-20; 24-26; 32), for different current intensities. Consequently, the lead-through openings for the connecting bars in the respective switch housings of a type series can all be configured identically, corresponding to the dimensions for the connecting bars of the maximum current intensity.

Figure 5

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Description

Connecting bars for electrical appliances and devices
for different nominal currents

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The invention relates to connecting bars made of profiled semifinished material for electrical appliances and devices for the connection of electrical components of the electrical appliances and devices to an external circuit, the [lacuna] having the same outer cross section for nominal currents of different levels and being accommodated in a wall of the appliances or devices, in a window opening adapted to said cross section, and fixed on the wall by fastening means.

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On the part of a connecting bar led through out of the housing to the outside, such as that described in FR 2 484 135 A1, an equipment-side power feeding bar can be connected in this way. The connecting bar is in this case generally arranged securely in the insulating wall of an appliance or device, which can take place for example by clamping bolts.

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According to the mentioned FR 2 484 135 A1, the connecting bars are adapted to the different nominal currents by putting together the standard cross section of a plurality of pieces, which consist of copper or aluminum. For the highest intended nominal current, only pieces made of copper are used, while for the lowest intended nominal current only pieces of aluminum are used. For nominal currents lying inbetween, the connecting bars have combinations of pieces made of the two said materials, for example one piece made of copper, three pieces made of aluminum.

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There is also the proposal (earlier patent application with the application number DE 199 30 813.6, published as DE 199 30 813 A1) of producing connecting bars from sections of a profiled semifinished material which has webs or ribs, which add to a cross section dependent on the nominal current to give a spacing dimension that is the same for all nominal currents. This makes it unnecessary to use different materials and a plurality of pieces.

Connecting bars of the type stated above may at the same time have a feature disclosed by DE 196 43 607 A1, that is a further projection (web, rib), which serves as an axial positioning and supporting means for the connecting bar on the wall of the housing of the appliance or device. Further fastening means are then either not required at all or only required in a simplified form. If bolts are used, they can engage in a nut thread, which is formed in a known way by a metallic insert nut or press-in nut located in the insulating material of the wall (DE 35 39 673 A1).

It follows from the descriptions given above that the current-carrying capacity, heat dissipation, provision of a surface for connections of power feeding bars and the absorption and transmission of static and dynamic forces are among the main tasks of the connecting bars. In addition, it is intended for it to be possible to accommodate connecting bars for different current intensities in walls with standard lead-through openings.

The object of the present invention is therefore to

provide connecting bars which have the properties mentioned and can be produced inexpensively.

This object is achieved according to the invention by the connecting bars being configured in such a way that they are hollow, with the same outer cross section, and the remaining wall thickness being adapted to the respective nominal current.

10 A current-carrying hollow arrangement is already described in US 3,597,713, which shows an apparatus as a substitute for a high-voltage fusible link, in which a combination of a vacuum switch with an operating handle, which has a lug in a way similar to a high-voltage or medium-voltage circuit breaker, is represented. Installed in a hollow connecting piece of the apparatus is an electronic circuit. Although this discloses a current-carrying hollow part on an electrical switching device, it serves only for accommodating another component of the apparatus, that is said electronic circuit, and not for regulating the current-carrying capacity of the subassembly.

A switching apparatus described in US 3 953 695 likewise has hollow connecting means. A coolant is passed through the cavity, since it is a heavy-current switching device and the dimensions of the connecting means are to be restricted. By contrast with the invention, it is therefore not based on an outer cross section which corresponds to the highest current value, with the cavity depending on the nominal current respectively intended.

In contrast to this, in the case of the connecting bars according to the invention the current-carrying capacity is regulated by means of the wall thickness of

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the hollow bar which forms the conducting, current-carrying

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cross section. It follows from this that, in the case of lower current intensities, there is a larger internal cavity as a result of lower wall thicknesses, or in the case of higher current intensities there is a smaller internal cavity as a result of thicker wall thicknesses, which can be taken to the extent of a solid configuration without a cavity, in the case of the highest rated current intensity. The lead-through openings in the respective housings of the appliances or devices are then designed for the outer dimensions required for this highest rated current intensity.

It may be expedient to provide the connecting bars with only one cavity. Various aspects, in particular the size of the overall outer cross section, may however favor the provision of a plurality of cavities.

In the case of connecting bars, bores may be required, formed with or without a thread, for example for purposes of fastening on the housing or against axial displacement. These bores may be arranged in a common axis or else offset with respect to one another. To avoid deformation of the hollow connecting bars being caused by the clamping force of the bolts led through these bores or screwed into the thread of these bores, suitable webs may be provided between the cavities of the connecting bars for increasing the strength. With respect to the production of the profiled material, this possibly means extra expenditure, but has no influence on the current-carrying capacity.

To avoid this possible extra expenditure, guiding grooves running transversely with respect to the longitudinal direction of the connecting bar may also be provided in the cavity of the connecting bar for supporting webs which are to be pushed in as and when required. The

supporting webs to be pushed into these guiding grooves may consist of the same material as the connecting bar, but may also consist of a different material.

- 5 These pushed-in supporting webs serve the same purpose as the molded-on supporting webs, that is to stabilize the connecting bar against deformation of the hollow connecting bar caused by the clamping force or loading exerted by screw bolts led through the bores or bolts
10 screwed into the thread of these bores.

Since these pushed-in supporting webs have no influence on the current-carrying capacity, other aspects, such as for example strength, can be taken into
15 consideration as assessment parameters for the selection of the material.

The bores mentioned above, formed with or without a thread, may be arranged in the region of cavities,
20 which is expedient in particular whenever the bolts are led through, these bolts then having to have a common axis and not requiring any thread.

If the bores are formed with a thread, it may be
25 advantageous to arrange them in such a way that they are located in a web. This makes larger thread lengths possible, which allows the screwed connection to be subjected to higher loading.

30 To avoid fastening bores, the connecting bars may also be provided with stops known per se for axial fixing. They are then fixed in the axial direction by suitable fastening elements known per se, for example clamping bolts. At the same time

or in addition, stops of this type can absorb axial forces and transmit them to the housing.

In the case of all the connecting bars described above,
5 the cavity or cavities can be arranged transversely with respect to the longitudinal extent of the connecting bar and be open on both sides. In this configuration, an extruded part can be advantageously produced as the starting material, from which
10 individual connecting bars of a respectively required width can be cut off.

The invention is to be explained in more detail below for better understanding on the basis of preferred
15 examples, which do not restrict the extent of protection of the invention, with reference to the associated drawing.

Figure 1 schematically shows a first embodiment of a
20 connecting bar, for a low current intensity.

Figure 2 schematically shows a second embodiment of a connecting bar, for a higher current intensity.

25 Figure 3 schematically shows a third embodiment of a connecting bar, with one cavity and fastening bores.

Figure 4 schematically shows a fourth embodiment of a connecting bar, with a plurality of cavities.

30 Figure 5 schematically shows a fifth embodiment of a connecting bar, with a plurality of cavities.

Figure 6 schematically shows a sixth embodiment of a connecting bar, with one cavity and supporting webs which can be pushed in arranged therein.

- 5 Figure 7 schematically shows a seventh embodiment of a connecting bar, with stops for axial fixing.

In figure 8, a connecting bar is shown in plan view, with an indicated device wall.

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Figure 1 shows a first embodiment of a connecting bar 1 for electrical appliances and devices for a low current intensity. In this embodiment, it has only a single cavity 2, which extends essentially over its entire dimension. This connecting bar 1 has a thinner wall 3, adapted to the low operating current. Since the outer dimensions, that is the outer cross section of the connecting bar 1, is intended to represent a constant, the cavity 2 is relatively large because of the small wall thickness.

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Figure 2 shows a second embodiment of a connecting bar 4 for electrical appliances and devices for a higher current intensity. In this embodiment, it likewise has only a single cavity 5, which extends essentially over its entire dimension. This connecting bar 4 has a thicker wall 6, adapted to the higher operating current. Since the outer dimensions, that is the outer cross section of the connecting bar 4, is likewise intended to represent a constant, the cavity 5 is relatively small because of the thicker wall thickness.

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Figure 3 shows a third embodiment of a connecting bar 7 for electrical appliances and devices with one cavity 8, which extends essentially over its entire dimension. This connecting bar 7 has bores 9; 10; 11; 12, which are provided for fastening purposes and, if appropriate, have a thread. In the example, the bores 9 and 10 are arranged in a common axis, which is required when through-bolts are used, and the bores 11 and 12 are arranged offset, which may be expedient for example when individual bolts are used. These bores are then provided with a thread.

Figure 4 shows a fourth embodiment of a connecting bar 13 for electrical appliances and devices with a plurality of cavities 18; 19; 20, between which webs 21; 22 are provided. In this connecting bar 13, bores 14; 15; 16; 17 are provided in the region of the cavities 18, 19 and 20. Said webs 21 and 22 serve for increasing the strength and for the purpose of avoiding deformation of the hollow connecting bar 13 caused by the clamping force or loading of the screw bolts led through these bores 14 to 17 or bolts screwed into the thread of these bores 14 to 17.

Figure 5 shows a fifth embodiment of a connecting bar 23 for electrical appliances and devices, with a plurality of cavities 24; 25; 26. In the case of this embodiment, the bores 27; 28, provided with a thread which is not represented, are arranged in such a way that they are located in a web 29; 30. As a result, greater thread lengths are possible, which makes it possible for the screwed connections to be subjected to higher loading.

Figure 6 shows a sixth embodiment of a connecting bar 31 for electrical appliances and devices, with a cavity 32 extending essentially over the entire extent of the connecting bar 31. In the case of this embodiment, the
5 profiled semifinished material has guiding grooves 35; 36; 37; 38, which are arranged transversely with respect to the longitudinal axis and into which supporting webs 33; 34 can be pushed as and when
10 required. The supporting webs 33; 34 which can be pushed into these guiding grooves 35; 36; 37; 38 may consist of the same material as the connecting bar 31, but may also consist of a different material.

These pushed-in supporting webs 33; 34 serve the same
15 purpose as the molded-on supporting webs, that is to stabilize the connecting bar 31 against deformation of the hollow connecting bar 31 caused by the clamping force or loading of screw bolts led through the bores 39; 40; 41; 42 or bolts screwed into the thread of
20 these bores. However, it is possible for no bores to be arranged in them.

Figure 7 shows a seventh embodiment of a connecting bar 43 for electrical appliances and devices with stops 44;
25 45 for axial fixing of the connecting bar 43 in the corresponding housing. By means of these stops 44; 45, the connecting bar 43 is fixed in the axial direction by suitable fastening elements, for example clamping bolts. At the same time or in addition, these stops
30 44; 45 can absorb axial forces and transmit them to the housing.

Figure 8 schematically illustrates one of the connecting bars described above, for example the connecting bar 1 (figure 1), in plan view. As can be seen, the cavity 2 extends transversely with respect to the longitudinal direction and is open on both sides. Also indicated is a wall of a device housing 46, through which the connecting bar 1 extends.

The advantages of the solution according to the invention are that standard outer dimensions of the connecting bars can be achieved within one overall size, dispensing with the need for spacers and the like. Standard insertion openings, and consequently standard housing dimensions, can be used within one overall size, which has the consequence of greatly reducing the range of different variants and of reducing costs. The bores of the hollow profiles may be punched, which is less costly and neater than drilling. The connecting technique is simplified to one variant for each overall size, thereby simplifying production. The greatly enlarged surface of hollow profiles which are open at the sides has the effect of better heat dissipation.

Patent claims

1. Connecting bars (1; 4; 7; 13; 23; 31; 43) made of
5 profiled semifinished material for electrical
appliances and devices for the connection of
electrical components of the electrical appliances
and devices to an external circuit, the connecting
10 bars (1; 4; 7; 13; 23; 31; 43) having the same
outer cross section for nominal currents of
different levels and being accommodated in a wall
(46) of the appliances or devices, in a window
15 opening adapted to said cross section, and fixed on
the wall by fastening means, characterized in that
the connecting bars (1; 4; 7; 13; 23; 31; 43) are
configured in such a way that they are hollow, with
the same outer cross section, and the remaining
20 wall thickness is adapted to the respective nominal
current.
2. The connecting bar as claimed in claim 1,
characterized in that the connecting bars (1; 4; 7;
31;) have only one cavity (2; 5; 8; 32).
3. The connecting bar as claimed in claim 1,
25 characterized in that the connecting bars (13; 23)
have a plurality of cavities (18-20; 24-26).
4. The connecting bar as claimed in one of the
preceding claims, characterized in that the
30 connecting bars (7; 13; 23; 31) have bores (9-12;
14-17; 27; 28; 39-42) for fastening purposes.
5. The connecting bar as claimed in claim 4,

characterized in that the bores (9-12; 14-17; 27; 28; 39-42) have a thread.

5 6. The connecting bar as claimed in claim 4, characterized in that the bores (9; 10; 14-17; 39-42) in a connecting bar (7; 13; 31;) on the upper side and the underside of the same are arranged in a common axis.

10 7. The connecting bar as claimed in claim 4, characterized in that the bores (11-12) in a connecting bar (7) on the upper side and the underside of the same are arranged offset with respect to one another.

15 8. The connecting bar as claimed in claim 1, characterized in that the connecting bars (13; 23) have between the cavities (18-20; 24-26) of the same suitable webs (21; 22; 29; 30) for increasing the strength.

20 9. The connecting bar as claimed in claims 4 and 8, characterized in that the bores (9-12; 14-17; 39-42) in the connecting bars (7; 13; 31) are arranged in the region of cavities (8; 18-20; 32).

25 10. The connecting bar as claimed in claims 4 and 8, characterized in that the bores (27; 28) in the connecting bars (23) are arranged in the webs (29; 30).

11. The connecting bar as claimed in claim 1, characterized in that the connecting bars (43) are provided with stops (44; 45) known per se for axial fixing.

5

12. The connecting bar as claimed in one of the preceding claims, characterized in that the cavity or cavities (18-20; 24-26) is or are arranged transversely with respect to the longitudinal extent of the connecting bar (1, 4, 7, 31; 13, 23) and is or are open on both sides.

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FIG 1

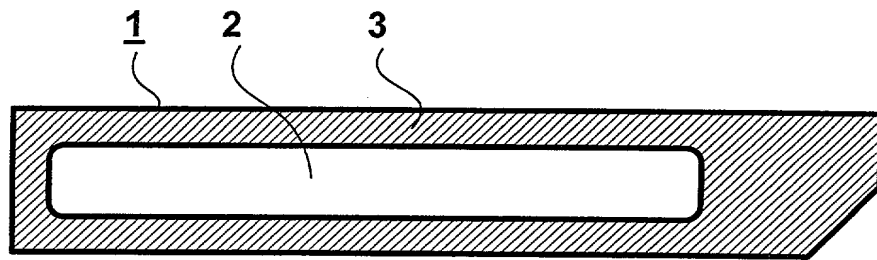


FIG 2

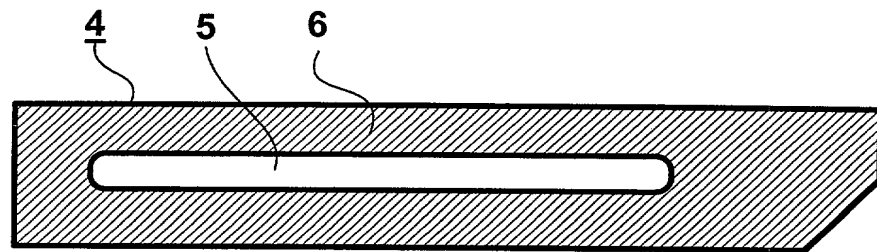


FIG 3

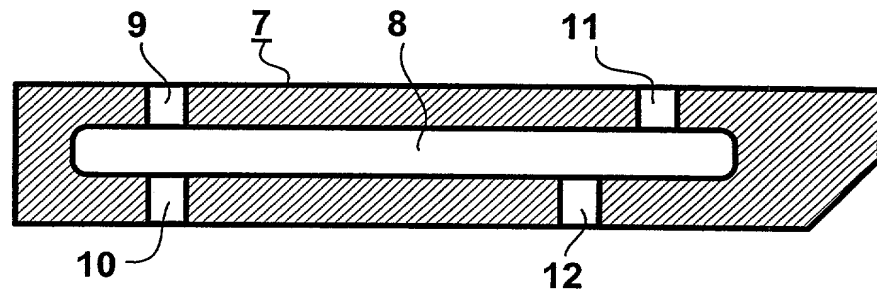


FIG 4

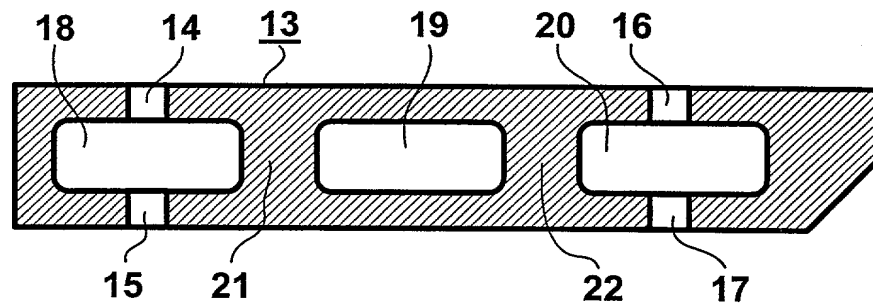
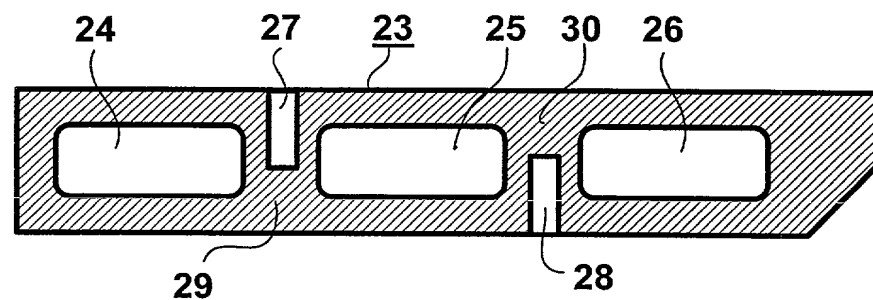


FIG 5



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FIG 6

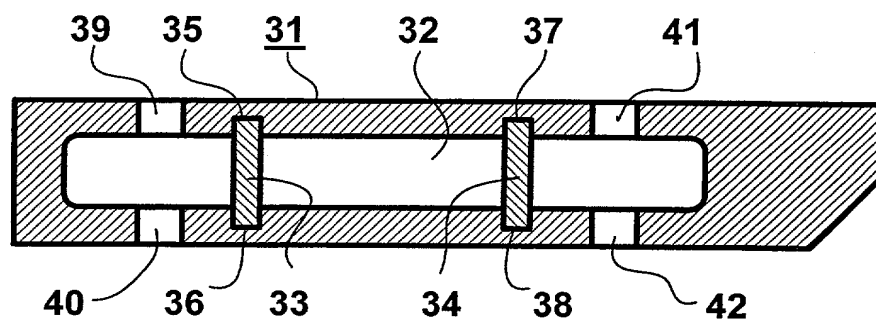


FIG 7

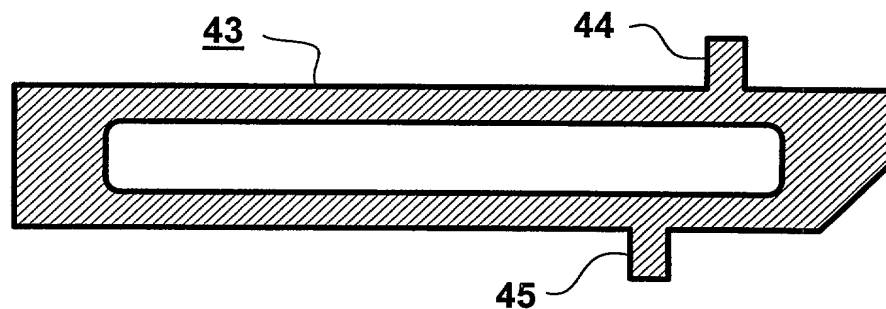
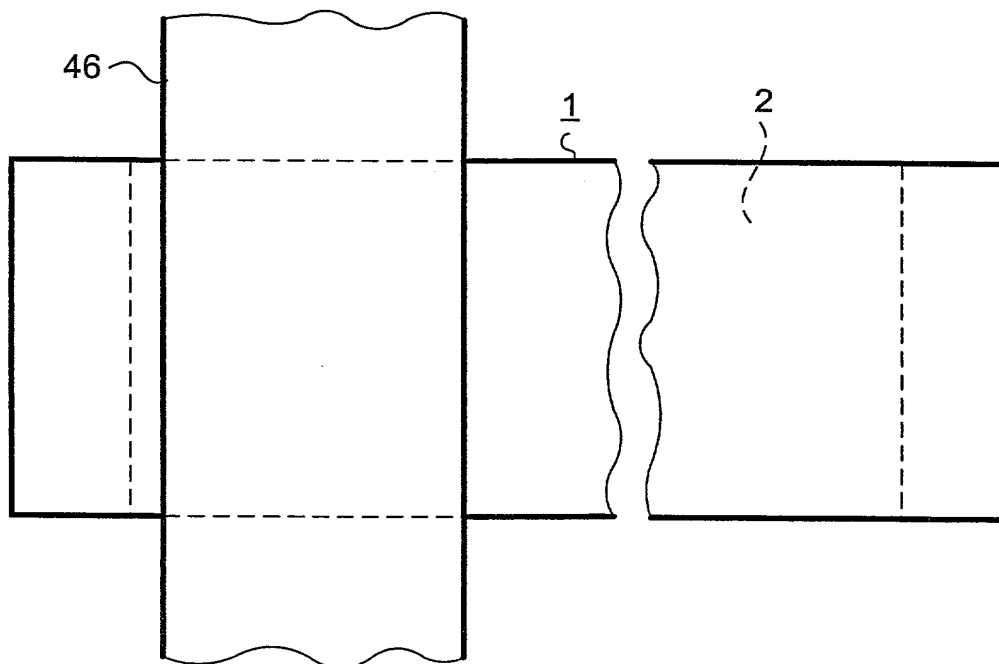


FIG 8



Declaration and Power of Attorney For Patent Application

Erklärung Für Patentanmeldungen Mit Vollmacht

German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

Anschlussschienen fuer elektrische
Geraete und Apparate fuer verschiedene
Nennstroeme

deren Beschreibung

(zutreffendes ankreuzen)

☐ hier beigefügt ist.

☒ am 11.08.2000 als

PCT internationale Anmeldung

PCT Anwendungsnummer PCT/DE00/02779

eingereicht wurde und am

abgeändert wurde (falls tatsächlich abgeändert).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

CONNECTING BARS FOR
ELECTRICAL APPLIANCES AND
DEVICES FOR DIFFERENT NOMINAL
CURRENTS

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on 11.08.2000 as

PCT international application

PCT Application No. PCT/DE00/02779

and was amended on

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

2006 F20 02864007

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Prior foreign applications
Priorität beansprucht

Priority Claimed

19939710.4

DE

18.08.1999

☒

☐

(Number)
(Nummer)

(Country)
(Land)

(Day Month Year Filed)
(Tag Monat Jahr eingereicht)

Yes
Ja

No
Nein

(Number)
(Nummer)

(Country)
(Land)

(Day Month Year Filed)
(Tag Monat Jahr eingereicht)

☐

☐

Yes
Ja

No
Nein

(Number)
(Nummer)

(Country)
(Land)

(Day Month Year Filed)
(Tag Monat Jahr eingereicht)

☐

☐

Yes
Ja

No
Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/DE00/02779

(Application Serial No.)
(Anmeldeseriennummer)

11.08.2000

(Filing Date D, M, Y)
(Anmeldedatum T, M, J)

anhängig

(Status)
(patentiert, anhängig,
aufgegeben)

pending

(Status)
(patented, pending,
abandoned)

(Application Serial No.)
(Anmeldeseriennummer)

(Filing Date D,M,Y)
(Anmeldedatum T, M, J)

(Status)
(patentiert, anhängig,
aufgeben)

(Status)
(patented, pending,
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Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden können, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

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And I hereby appoint

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1-000-02292

2-00

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